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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/838,084	04/18/2001	Guo-Qiang Lo	IDT-1651	9576

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EXAMINER	
FOURSON III, GEORGE R	
ART UNIT	**PAPER NUMBER**
2823	

DATE MAILED: 09/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/838,084	LO ET AL.	
	Examiner	Art Unit	
	George Fourson	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 August 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) *5-10* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4 and 11-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

The finality of the office action mailed 4/30/05 is withdrawn in view of applicant's argument regarding the expectation that the oxynitride layer of Cheng et al would have a hydrogen content.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1-4,11,18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Cheng et al '382 in view of Ballantine, the combination further in view of either one of Hanratty et al or Tobben et al.

Cheng et al. discloses a method of forming trench isolation structure which includes forming pad oxide layer 12 over on semiconductor substrate 10 (Co1. 4, lines 15-16, Col. 8, lines 9-13, and Figs. IA and 3A), then forming silicon nitride layer 14 over pad oxide layer 12 (Co1. 4, lines 15-20), then forming an antireflective layer such as silicon oxynitride layer 16 over silicon nitride layer 14 (Col. 4, lines 22-24), subsequently forming photoresist layer 18 on silicon oxynitride layer 16 (Co1. 4, lines 31-32), then photolithographically patterning to define trench opening 8 (Co1. 4, lines 32-36), then etching through silicon oxynitride layer 16, silicon nitride layer 14 and pad oxide layer 12 and substrate 10 (Co1. 4, lines 37-40), subsequently removing photoresist layer 18 and etching through substrate 10 to form a trench (Co1. 4, lines 53-57, and Fig. 1B), then forming thermal oxide layer 70a through rapid thermal oxidation to a thickness of about 100â to 3OOâ and, thereby, conditioning the exposed silicon oxynitride layer 16 (Co1. 8,

lines 12-26, and Fig. 3A), subsequently performing wet clean step using HF (hydrogen fluoride) to clean the trench (Col. 8, lines 27-37, and Fig. 3B), growing liner oxide layer 72a after the wet clean step thereby conditioning the remaining silicon oxynitride layer 16 (Col. 8, lines 38-40, and Fig. 3C), then depositing insulating material 74 over liner oxide layer 72a (Co1. 8, lines 47-48, and Fig. 3D), and subsequently performing a CMP process to removing portions of insulating material 74, the conditioned silicon oxynitride layer 16 and silicon nitride layer 14 (Co1. 8, lines 58-64, and Fig. 3E).

Cheng et a1. does not disclose that rapid thermal anneal is performed for about 20 seconds at a temperature of about 9000C.

Ballantine et al. teachings a method of forming a shallow trench isolation structure in semiconductor device which includes providing silicon substrate 1 (Co1. 2, lines 6-7, and Fig. 5), then forming pad oxide 2 and nitride layer 3 over substrate 1 (Co1. 2, lines 8-10), subsequently forming mask layer 5 over nitride layer 3 (Co1. 2, lines 1 1-15, and Fig. 6), then forming trench 6 by etching through nitride layer 3, pad oxide 2 and substrate 1 (Co1. 2, lines 16-20, and Fig. 7), subsequently forming oxide liner 8 in trench 6 by rapid thermal oxidation process at a temperature of about 900 to I300OC for 1 second to less than 3 minutes to a thickness of about 225A to 4O0A (Co1. 2, lines 30-43), subsequently filing trench 6 with insulating material (Co1. 3, lines 16-24, and Fig. 10), and then planarizing trench 6 by chemical-mechanical polishing process (Co1. 3, lines 25-36, and Figs. 11 and 13).

It would have been within the scope to one ordinary skill in the art to combine the teachings of Ballantine et al. with Cheng et a1. because it would enable formation of thermal oxide layer 7Oa of Cheng et al. to be performed.

Note the disclosed temperature and duration of the oxidation process are within the recited ranges.

Cheng et al is silent with respect to the source gases used to form the oxynitride layer and therefor there is insufficient indication that the layer would contain hydrogen. Hanratty et al discloses formation of hydrogenated oxynitride antireflective layer 110 by PECVD using silane and nitrous oxide (col.2, lines 52-60). Tobben et al discloses formation of PECVD oxynitride layer 41 using silane and nitrous oxide (col.16, lines 48-57). It would have been obvious to one of ordinary skill in the art to combine the teachings of Cheng et al and either one of Hanratty et al or Tobben et al to enable formation of the PECVD oxynitride antireflective layer of Cheng et al to be performed according to the teachings of either one of Hanratty et al or Tobben et al. In that even the oxynitride layer of the combination relied on above would contain hydrogen and would be changed in composition as recited because the same materials would be treated in the same manner as in the instant invention.

Applicant argues that the reference aims to produce a thermal oxide layer and therefor would not condition the oxynitride layer as recited. However, the conditions disclosed by Ballantine et al overlap the conditions recited in claim 4 for example and would therefor, by applicant's admission, produce the conditioning recited.

Claims 12-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Cheng et al '382 in view of Ballantine, the combination further in view of either one of Hanratty et al or Tobben et al as applied to claims 1-4,11,18 and 20 above, and further in view of Wolf.

Wolf teaches patterning photoresist layer by exposing the layer through a reticle in photolithography process (p. 407 and 476) It would have been within the scope to one ordinary skill in the art to combine the teachings of Wolf with Cheng et al. because it would enable formation of photoresist layer 18 of Cheng et al. to be performed.

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Cheng et al '382 in view of Ballantine, the combination further in view of either one of Hanratty et al or Tobben et al as applied to claim1-4,11,18 and 20 above, and further in view of Applicant's Admitted Prior Art.

The combination process does not disclose the step in claim 19.
AAPA discloses a wet cleaning process in the presence of silicon oxynitride layer by using hydrogen fluoride (HF) and buffered oxide etch (BOE) (instant p. 2-3).
It would have been within the scope to one ordinary skill in the art to combine the teachings of AAPA with Cheng et a1. because it would enable the step of performing the wet clean process of Cheng et al. to be performed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to George Fourson whose telephone number is (571) 272-1860. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith, can be reached on (571) 272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

George Fourson
Primary Examiner
Art Unit 2823

GFourson
September 12, 2005